

IMPRS LECTURE DAY: GQFI

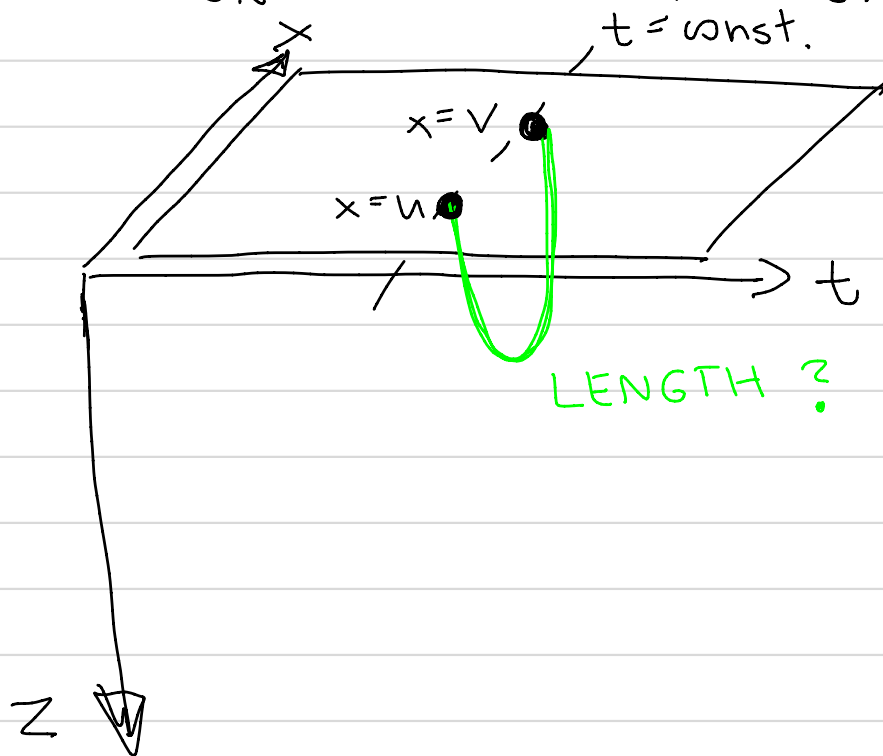
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22 NOV 2017

TUTORIAL: WED, HOMEWORK WED → FRI

CONSIDER POINARÉ PATCH AdS_{d+1} :

- (A) FOR AdS_3 CALCULATE THE LENGTH OF THE GEODESIC CONNECTING END-POINTS OF AN INTERVAL LYING ON SOME TIME-SLICE ON THE BOUNDARY OF AdS_3



WHY DO YOU THINK THESE GEODESICS AND THEIR LENGTHS CAN BE INTERESTING?

- (B) GENERALIZE THIS CONSTRUCTION TO AdS_{d+1} . REGARD THE PAIR OF POINTS IN (A) AS SETTING THE BOUNDARY OF A SPATIAL SUBREGION (THE INTERVAL) ON THE BOUNDARY OF AdS_3 .

WHAT WOULD BE THE MOST SYMMETRIC SUBREGION IN THE GENERAL CASE (AdS_{d+1})?

(C) SO FAR it is ALL 100% GEOMETRY WITHOUT AdS/CFT (OR EVEN GR). IMAGINE NOW THIS AdS_{d+1} IS A SOLUTION OF GRAVITY EQUATIONS OF MOTION ORIGINATING FROM

$$\frac{1}{16\pi G_N} \int d^{d+1}x (R + \dots)$$

WHAT IS THE NATURAL WAY TO MEASURE THE AREA FROM THE PREVIOUS POINT?

IN MON EXERCISE SET YOU WERE ASKED TO COMPUTE VOLUME OF A TIME-SLICE OF AdS_{d+1} . DO YOU THINK THERE IS A NATURAL WAY TO MAKE IT DIMENSIONLESS?

(D) IN PREVIOUS HOMEWORK YOU LEARNT ABOUT BLACK HOLES IN AdS.

IS IT CONCEIVABLE THAT THE GEODESIC FROM (A) IS THE BIFURCATION SURFACE OF SOME EXOTIC BLACK HOLE?

HINT: GOOGLE "TOPOLOGICAL BLACK HOLE IN AdS" AND RELATED QUERIES

EXPLANATION: THIS IDEA LIES AT THE CENTER OF 1102.0440 (500+ CITES) THAT PROVIDED THE FIRST NON-TRIVIAL PROOF OF AN EXAMPLE OF RT PROPOSAL. (SEE RO'S LECTURE ON FRI)

(E) CONSIDER THE LENGTH \mathcal{L} FROM EXERCISE (A) AS A FUNCTION OF ENDPOINTS POSITIONS u AND v ON A TIME SLICE. CONSIDER NOW:

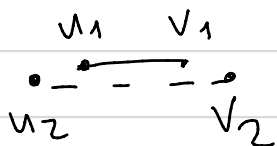
$$ds^2 \sim \left\{ \frac{\partial^2}{\partial u \partial v} \mathcal{L}(u, v) \right\} du dv$$

WHAT KIND OF SPACETIME IS IT?

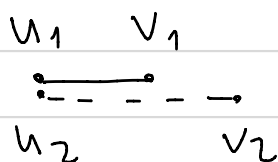
YOU HAVE JUST RE-DISCOVERED THE SO-CALLED KINEMATIC SPACE INTRODUCED IN 1505.05515.

THIS SPACETIME IS AN AUXILIARY CONSTRUCT THAT GEOMETRIZES CONTAINMENT RELATIONS BETWEEN INTERVALS IN CFT_2 IN TERMS OF CAUSAL RELATIONS:

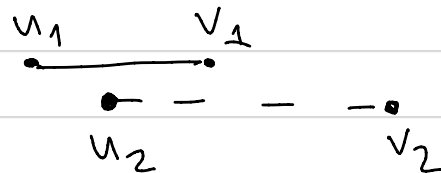
TIMELIKE



NULL



SPACELIKE



TO SEE HOW IT GENERALIZES TO CFT_{d+1} , SEE 1604.03110 AND 1606.03307.

WHY IS IT IMPORTANT?: THE KINEMATIC SPACE WAS CONJECTURED TO BE RELATED TO MULTISCALE ENTANGLEMENT RENORMALIZATION ANSATZ (MERA) AND IS A NATURAL OBJECT FROM THE POINT OF VIEW OF BULK RECONSTRUCTION.